

# Exhibit 3



IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel,	)	
W.A. DREW EDMONDSON, in his	)	
capacity as ATTORNEY GENERAL	)	
OF THE STATE OF OKLAHOMA,	)	
et al.	)	
	)	
Plaintiffs,	)	
	)	
vs.	)	No. 05-CV-329-GKF-PJC
	)	
TYSON FOODS, INC., et al.,	)	
	)	
Defendants.	)	

VOLUME 97 - AM  
TRANSCRIPT OF NONJURY TRIAL PROCEEDINGS  
JANUARY 25, 2010  
BEFORE GREGORY K. FRIZZELL, U.S. DISTRICT JUDGE

REPORTED BY:                      BRIAN P. NEIL, CSR-RPR, RMR, CRR  
   United States Court Reporter

1           So in my particular case, I was able to use  
2     the observed data, create an empirical relationship  
3     that did describe implicitly fate and transport  
4     processes, it took the phosphorus from the edge of the  
5     field, took phosphorus from the wastewater treatment,  
6     and determined when this showed up at the gauging  
7     stations and how much of it showed up. It just didn't  
8     describe every process along the way.

9           THE COURT: Let's take a break. We're  
10    here in this subject matter at the heart of this  
11    lawsuit in terms of causation relative to describing  
12    the process between the edge-of-field and these three  
13    gauging stations. I mean, this is the heart in terms  
14    of causation so we need to focus on this.

15           Let's take a recess.

16                   *(Short break)*

17           THE COURT: Mr. Page.

18           MR. PAGE: Thank you, Your Honor.

19           THE COURT: Yes, sir.

20           Q.    (BY MR. PAGE) Dr. Engel, before the break,  
21    we were talking about the empirical routing model that  
22    you employed. Now, this empirical model models  
23    phosphorus from where to where?

24           A.    So it models the phosphorus as it reaches the  
25    edge of the field as predicted by the GLEAMS model so

1 impact.' Are you saying the dominant impact or one of  
2 the dominant impacts?"

3 "The Witness: Based on the data that I have,  
4 it appears to be the dominant impact"?

5 "QUESTION: And what form of phosphorus are  
6 they seeing that 80 percent of the time?

7 "ANSWER: It's dominantly dissolved  
8 phosphorus, as we saw earlier in the plot of how much  
9 of the phosphorus is dissolved versus river flow.  
10 Under base flow conditions, it's probably on (the)  
11 average of 80 to 85 percent dissolved, and from the  
12 wastewater-treatment plants being the source, most of  
13 that dissolved is soluble-reactive phosphorus.

14 "ANSWER: And that correspondence confirms  
15 for me the dominant source of . . .  
16 wastewater-treatment plants under base flow conditions  
17 that are occurring eight out of ten days during the  
18 principle growing period for algae further reinforces  
19 the idea that the wastewater-treatment plants are  
20 providing the phosphorus to the algae, and then  
21 lastly, the idea that most of that phosphorus is in a  
22 form that algae can use."

23 Now, Dr. Engel, do you agree with  
24 Dr. Connolly's opinions concerning the dominant form  
25 of phosphorus in this watershed being from

1 wastewater-treatment plants?

2 A. No.

3 Q. Why is that?

4 A. I conducted an analysis of the data from the  
5 watersheds that were used in the poultry house density  
6 analysis -- the court may remember my testimony on  
7 that earlier, I guess last year now at this point --  
8 in which we looked at runoff, as well as base flow,  
9 from 12 subwatersheds in the Illinois River Watershed.  
10 The 12 that were used in my analysis did not have  
11 wastewater treatment impacts in them so there were no  
12 wastewater treatment discharges in these 12  
13 watersheds.

14 The base flow data, we had both total  
15 phosphorus as well as soluble-reactive phosphorus  
16 available from those watersheds. My analysis of that  
17 data clearly indicates there's soluble-reactive  
18 phosphorus in base flow coming from these watersheds,  
19 and it ranges from, I believe, seven to about sixty,  
20 eighty, ninety micrograms per liter, and it represents  
21 about two-thirds of the total phosphorus --  
22 soluble-reactive represents about two-thirds of the  
23 total phosphorus in base flow from these watersheds.

24 So clearly there are other places, other  
25 nonpoint sources, contributing soluble-reactive

1 phosphorus to base flow.

2 Q. Now, Dr. Engel, would you look with me on  
3 Demonstrative 414, please? What is this, sir?

4 A. So this table summarizes the soluble-reactive  
5 phosphorus data from these small watersheds or small  
6 tributaries that I was describing a moment ago.

7 So each of those 12 watersheds is labeled  
8 here under the watershed, this first column, so HFS 02  
9 is the first of these. And then at the bottom, some  
10 averages are going to be presented.

11 The second column represents the average base  
12 flow soluble-reactive phosphorus in micrograms per  
13 liter. That ranges from a low of 7 for high flow  
14 station 26 to 51, it looks like, for high flow station  
15 16 and the average is 27.

16 Q. So that's all soluble-reactive phosphorus  
17 that's concentrations displayed there?

18 A. Correct. So these would be soluble-reactive  
19 phosphorus in base flow from multiple samples from  
20 these locations.

21 Q. Did all of the subwatersheds that you  
22 analyzed that did not have wastewater-treatment plant  
23 discharge have soluble-reactive phosphorus in base  
24 flows?

25 A. Yes.

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I N D E X

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*REBUTTAL WITNESSES ON BEHALF OF THE PLAINTIFFS*

**BERNARD ENGEL, PH.D.**

Direct Examination by Mr. Page

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Cross-Examination by Mr. George

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VOLUME 98, P.M. SESSION

APPEARANCES:

For the Plaintiffs: MR. W.A. DREW EDMONDSON  
Attorney General  
MS. KELLY FOSTER  
Assistant Attorney General  
State of Oklahoma  
313 N.E. 21st St.  
Oklahoma City, OK 73105

1 Q. If we scroll out, we can find those -- they're  
2 a little harder to find in the spreadsheet. We can  
3 find them on your spreadsheet in columns AP through  
4 AW in rows 1 through 3. Do you see your  
5 Nash-Sutcliffe values?

6 A. Yes. I believe those are the values here in  
7 AQ, AT and AW for each of the gauging stations.  
8 That's my recollection.

9 Q. And for the record, can you provide the court  
10 and the record with what those Nash-Sutcliffe values  
11 were for this particular model run?

12 A. Looks like there are -- looks like there are  
13 probably two values provided for each gauging  
14 station location, so it looks like the values in AQ2  
15 and AQ3 are for the Illinois River at Tahlequah,  
16 values being 0.965559 and 0.96128. I don't recall  
17 which periods those represent without looking  
18 underneath the data again. And then there would be  
19 values for Barren Fork in the AT column of 0.82945  
20 and in AT3 of 0.757399. So that would be for Barren  
21 Fork.

22 For Caney Creek would be out in the AW  
23 column. Those would be in AW2 and AW3, values would  
24 be 0.550431 and 0.650948.

25 Q. Doctor, once again, the closer those values are

1 to one, the stronger the relationship or the  
2 correlation between observed loads and predicted  
3 loads, right?

4 A. Yes, that would be the case.

5 Q. Once again, the higher those values, the  
6 Nash-Sutcliffe values, the more confidence you place  
7 in the model as being useful as a predictive tool,  
8 correct?

9 A. That would generally be the case but, again,  
10 there's broader context here as well.

11 Q. Well, do you recall, Doctor -- I have a sense  
12 you're a little hesitant, and I want to explore it a  
13 little bit. Do you recall the last time you were in  
14 this courtroom and you were asked by Mr. Page about  
15 the performance of the model, and you told His Honor  
16 that the model performed well because of these high  
17 Nash-Sutcliffe and  $R^2$  coefficients or statistics?  
18 Do you recall that?

19 A. Yes.

20 Q. You're not backing away from that statement,  
21 are you?

22 A. No.

23 Q. Let's get our head out of the spreadsheet for a  
24 moment and talk more conceptually about your routing  
25 model. So I think we've established, Doctor, that

1 Watershed as part of its TMDL?

2 MR. PAGE: Objection, Your Honor, assumes  
3 facts not in evidence.

4 MR. GEORGE: I asked whether he was aware.

5 THE COURT: Overruled.

6 THE WITNESS: I'm not sure that I've seen  
7 any indication whether they were or weren't.

8 Q. (By Mr. George) If they were headed down that  
9 path, would that be a mistake, in your view?

10 A. Based on my conversations with other  
11 scientists, based on my review of data and  
12 scientific reports for the Illinois River Watershed,  
13 I think that will present some real challenges.

14 Q. Let's look at these coefficients in a little  
15 detail and talk about how they are created. Doctor,  
16 the coefficients are calculated, their numeric  
17 values, prior to using the model for the forecast  
18 and the hindcast; is that right?

19 A. Yes.

20 Q. But when you first selected -- I think we  
21 established this earlier -- your particular routing  
22 equation, the coefficients did not have specific  
23 numerical values, right?

24 A. When I wrote the form of the model, the  
25 coefficients had, I guess, letters as placeholders,

1 and those specific numeric values were later  
2 determined, as we've discussed.

3 Q. They were determined as part of the calibration  
4 process, right?

5 A. Yes.

6 Q. And so the way this works, Doctor, is you  
7 started by taking the output from your GLEAMS model  
8 to represent runoff in the Illinois River Watershed  
9 for 1998 to 2006, right? That was one of the first  
10 steps in your calibration process with the routing  
11 model?

12 A. Right. So GLEAMS was run to obtain those  
13 outputs.

14 Q. Then you added to that the wastewater treatment  
15 plant loads for the same time period, right?

16 A. Correct.

17 Q. Then you put that combined sum -- and the  
18 routing model doesn't care the difference between  
19 the two -- into the daily P to river value in your  
20 routing model, correct?

21 MR. PAGE: Objection, Your Honor. I think  
22 that question is ambiguous. I don't know what he  
23 means, a routing model doesn't care the  
24 difference --

25 MR. GEORGE: If it's unclear, I'm happy to

1 THE COURT: You may, sir.

2 Q. (By Mr. George) Doctor, what we've put on the  
3 screen and what I've handed to you is a  
4 demonstrative exhibit that follows each of your and  
5 Dr. Bierman's calibrations through the process and  
6 shows the  $R^2$  results and the Nash-Sutcliffe  
7 results.

8 And there are four pages. The first two  
9 pages relate to a comparison of your second errata  
10 phosphorus loads and  $R^2$  with Dr. Bierman's  
11 sensitivity analysis, and then the last two pages  
12 focus on the S&P 500.

13 The reason I've broken them out, you  
14 recall, do you not, that Dr. Bierman only did his  
15 S&P 500 test on the Illinois River main stem, right?  
16 A. Correct.

17 Q. So, Doctor, you understand this schematic in  
18 terms of what is shown. You see in the top panel  
19 the magnitude of the increases that Dr. Bierman  
20 applied. And you discussed this, I believe, in your  
21 direct to -- as compared to your second errata and  
22 some of his tests, you see the increased nonpoint  
23 source and the increased wastewater treatment  
24 plant?

25 A. Yes, I see those.

1 Q. Those are substantial increases over the loads  
2 that you used that are shown in the second errata,  
3 do you see that?

4 A. Yes.

5 Q. And then he fed that information through the  
6 routing model. And the way your routing model  
7 works, when you feed in new loads and it runs, it  
8 generates  $R^2$  and Nash-Sutcliffes, right?

9 A. Correct.

10 Q. And he calibrated your routing model as part of  
11 these tests as well, correct?

12 A. Well, he -- I wouldn't call what he did a  
13 calibration. You know, the inputs didn't reflect  
14 any sense of reality and nor did the observed loads  
15 reflect what would occur under those conditions, so  
16 I would disagree with your description of this.

17 Q. Let's look at the results in terms of  $R^2$   
18 values. You see in the bottom that there's a chart  
19 there that shows the  $R^2$  values that you report from  
20 your second errata for each of these subwatersheds.  
21 What's the range of those  $R^2$  values?

22 A. So it looks like from .62 to .97 maybe.

23 Q. Then, Doctor, the next three rows show the  $R^2$   
24 values computed by the routing model for the three  
25 different scenarios with increased or different

1 loads by Dr. Engel, do you see those?

2 MR. PAGE: Your Honor --

3 MR. GEORGE: I'm sorry, by Dr. Bierman.

4 MR. PAGE: I think that's testimony that's  
5 not in evidence. There's been no evidence of these  
6  $R^2$  with this procedure by Dr. Bierman.

7 MR. GEORGE: I think Dr. Bierman, who  
8 Dr. Engel is here rebutting, testified at length  
9 about the  $R^2$  values and his tasks compared to  
10 Dr. Engel's.

11 THE COURT: Overruled.

12 Q. (By Mr. George) Do you see those values,  
13 Doctor?

14 A. We're talking about the increased NPS line of  
15 this table?

16 Q. Yes. We can take all three of them, if you  
17 want to, for efficiency, the increased nonpoint  
18 source load, the increased wastewater treatment  
19 plant loads, then reversing your daily phosphorus  
20 loads.

21 A. Right.

22 Q. What's the range of  $R^2$  values that Dr. Bierman  
23 got when he recalibrated your model and ran his  
24 tests?

25 MR. PAGE: Objection, Your Honor. That's

1 contrary to the witness's statement. The witness  
2 has disagreed with counsel that Dr. Bierman  
3 recalibrated his model.

4 MR. GEORGE: Your Honor, we could quarrel  
5 over this all day long, I suspect, in terms of  
6 semantics. If there's another phrase that the  
7 doctor would like for me to use, I would be happy  
8 to.

9 THE COURT: Overruled. Go ahead.

10 Q. (By Mr. George) What are the range of values,  
11 Doctor?

12 A. Well, the range of values are like .72 to .97.

13 Q. Doctor, those are as good, if not better, than  
14 the  $R^2$  that you report using what you claim are more  
15 realistic phosphorus loads, right?

16 A. Yes.

17 Q. If you'll turn to the second page, Doctor, it's  
18 the same format. The only difference here is we've  
19 shown the Nash-Sutcliffe values as opposed to the  $R^2$   
20 values in the bottom panel. Do you see that?

21 A. Okay.

22 Q. For the benefit of the record, in your second  
23 errata, you agree with me the Nash-Sutcliffe values  
24 that you report range from .55 for Caney Creek to  
25 .96 for the Illinois River?

1 A. Yes.

2 Q. And then we have a comparison with  
3 Dr. Bierman's test with increased loads. And do you  
4 agree that they range from a low of .76 to a high of  
5 .96?

6 A. I'm not sure I would characterize it as a test,  
7 but I mean, the numerical values reported in the  
8 table are in that range.

9 Q. Those are as good, if not better, than the  
10 Nash-Sutcliffe values that you obtained using what  
11 you claim to be more realistic phosphorus loads,  
12 right?

13 A. I'm not sure I would characterize them as good  
14 or better. So there's, again, broader context that  
15 these were done in many cases with unrealistic  
16 values, and so making that interpretation would be  
17 inappropriate.

18 Q. Are the Nash-Sutcliffes higher in his analysis  
19 as compared to yours?

20 A. Looks like in some instances, the  
21 Nash-Sutcliffes in this table are higher.

22 Q. Doctor, if you'll turn to the third page, the  
23 format is the same, only now we've shown the S&P  
24 values that were replaced in Dr. Bierman's  
25 analysis. And you see at the bottom that we again

1 have a comparison of  $R^2$  values.

2 A. Yes.

3 Q. As compared to what you obtained in your second  
4 errata using what you claim to be more realistic  
5 phosphorus loads, Dr. Bierman obtained the same  $R^2$   
6 in his evaluation, did he not?

7 A. The reported values are the same, yes.

8 Q. They're both .97, aren't they?

9 A. Yes.

10 Q. That suggests a strong correlation between the  
11 S&P values that he plugged in and the phosphorus  
12 loads at Lake Tenkiller, doesn't it?

13 A. Well, there were other problems with the S&P  
14 analysis, as I talked about this morning, and so  
15 when the models were uncoupled, you know, the S&P  
16 was providing nonpoint source inputs on days that it  
17 didn't rain, which logic tells one that wasn't  
18 happening.

19 So there has to be context with some of  
20 these, so when you rip these apart like this, you  
21 lose context. And just looking at  $R^2$  may not mean a  
22 lot in this case.

23 Q. So I want to make sure I understand.  $R^2$  don't  
24 mean a lot in this case; is that your testimony?

25 MR. PAGE: Objection, Your Honor, that's

1 not his testimony.

2 THE COURT: Sustained.

3 MR. GEORGE: I'm sorry if I misunderstood.

4 Q. (By Mr. George) Dr. Engel, let's look at the  
5 last page of this demonstrative just to close the  
6 loop on this. We again have the loads for the S&P  
7 500 in place of the phosphorus loads that you used,  
8 and then at the bottom a comparison of the  
9 Nash-Sutcliffe this time as opposed to  $R^2$ . Do you  
10 see that?

11 A. Yes.

12 Q. Once again, is it true that Dr. Bierman  
13 obtained the same Nash-Sutcliffe .96 using the S&P  
14 500 Index values as compared to your phosphorus  
15 loads in your second errata?

16 A. The reported numerical values were the same.  
17 And, again, this same contextual issue would apply  
18 in that by decoupling the models, we've now created  
19 an unrealistic set of inputs that don't match what's  
20 happening.

21 Q. Doctor, given that you can calibrate this model  
22 for five different sets of inputs and have all of  
23 those generate results that correlate equally well  
24 to the same observed loads, there's no way of  
25 knowing which calibration is correct, is there?

1 witness.

2 THE COURT: Redirect.

3 MR. PAGE: Thank you, Your Honor.

4 Could we leave Tyson Demonstrative 257 up,  
5 please. This is the one with the bar charts that  
6 was from -- the one I can remember the best, so we  
7 better start with that one first.

8 REDIRECT EXAMINATION

9 BY MR. PAGE:

10 Q. Dr. Engel, we just heard testimony on this  
11 particular chart. Are there more than 12 small  
12 watersheds in the IRW contributing to the Illinois  
13 River?

14 A. Yes, there would be on the order of several  
15 hundred the size of these small watersheds.

16 Q. And, sir, would you say that the majority or  
17 somewhat less than majority of these small  
18 watersheds are influenced by wastewater treatment  
19 plant?

20 A. So the -- there would be very few of these  
21 small watersheds influenced by wastewater treatment  
22 plant discharge.

23 Q. So we're not just talking about 12 possible  
24 small watersheds that would contribute nonpoint  
25 source SRP in the IRW, are we, sir?

1 A. No. There would be on the order of several  
2 hundred.

3 Q. How many of those several hundred actually are  
4 influenced by wastewater treatment plant?

5 A. I'm not sure of the number, but it would be,  
6 you know, certainly less than 50, less than 20.

7 Q. Now, let's talk about these two subwatersheds  
8 that were left out of your 12 watershed analyses.  
9 That's HFS 04 and HFS 22, correct, sir?

10 A. Yes.

11 Q. And Mr. George asked you some questions about  
12 the level of concentrations of -- in those two  
13 subwatersheds, correct?

14 A. Yes.

15 Q. And they are, those in the base flow, much  
16 higher than the average concentrations from the  
17 other 12; is that correct?

18 A. Correct.

19 Q. Now, have you evaluated the land uses relating  
20 to those two watersheds, that is HFS 04 and 22?

21 A. I have evaluated them, but I am not recalling  
22 what the land uses are at this point, but they did  
23 include wastewater treatment plant discharge.

24 Q. Did they also include poultry houses?

25 A. They would have included some poultry houses as

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**DR. BERNARD ENGEL**

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**DR. JOHN CONNOLLY**

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**REBUTTAL WITNESSES ON BEHALF OF PLAINTIFFS**

**DR. SCOTT WELLS**

Direct Examination by Mr. Page 11526

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APPEARANCES:

For the Plaintiffs: MR. W.A. DREW EDMONDSON  
Attorney General  
MS. KELLY FOSTER  
Assistant Attorney General  
State of Oklahoma  
313 N.E. 21st St.  
Oklahoma City, OK 73105

1 how to deal with it in our findings.

2 THE COURT: No, you misunderstand. I can  
3 possibly take judicial notice under 201(c). I may  
4 or may not. And I don't have to decide today. So I  
5 won't.

6 MR. NANCE: I just wanted to understand  
7 what the court had said, and now I do.

8 THE COURT: I'm just giving you an idea.  
9 It seems to me that a Federal Register notice,  
10 particularly as it pertains to this watershed, may  
11 well be something that I ought to take judicial  
12 notice of. And if I were sitting on the Tenth  
13 Circuit, I'd scratch my head and wonder why that  
14 silly judge didn't take judicial notice of it. But  
15 I'm not deciding that today. It hit me cold here.

16 It strikes me that the Chesapeake Bay  
17 letter probably won't be something that I take  
18 judicial notice of. But I also took a fresh look at  
19 Rule 52, again (c), and it specifically provides  
20 that the court may, however, decline to render any  
21 judgment until the close of the evidence. I'm going  
22 to decline to enter judgment on the two remaining  
23 Rule 52(c) subsets, state public law nuisance and  
24 statutory claims, and we'll leave that for findings  
25 and conclusions. Particularly since I have to enter

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**DR. SCOTT WELLS**

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